

What is claimed is:

1. A puncture difficulty evaluating device, comprising:
an ultrasonic transmitting section that irradiates a measurement point of a specimen with an ultrasonic pulse;
an ultrasound receiver section that receives the ultrasound backscattered at the measurement point and determines an integral of the power of the ultrasound over a predetermined angle range;
and
a parameter generating section that generates a parameter indicating the difficulty of puncture in the measurement point based on the integral determined in the ultrasonic receiver section.
2. The puncture difficulty evaluating device according to claim 1, wherein the ultrasonic receiver section determines a first integral of the power of the ultrasound backscattered at the measurement point over a first predetermined angle range and a second integral of the power of the ultrasound backscattered at the measurement point over a second predetermined angle range that is different from the first angle range, and
the parameter generating section generates the parameter based on both the first integral and the second integral determined in the ultrasonic receiver section.

3. The puncture difficulty evaluating device according to claim 2, wherein the parameter generating section generates the parameter by determining the ratio between the first integral and the second integral.

4. The puncture difficulty evaluating device according to claim 2, wherein the parameter generating section generates the parameter by determining the difference between the first integral and the second integral.

5. The puncture difficulty evaluating device according to claim 2, wherein the parameter generating section generates the parameter by determining the ratio between the difference between the first integral and the second integral and the difference between the first angle and the second angle.

6. The puncture difficulty evaluating device according to claim 1, further comprising a puncture difficulty determining section that determines the difficulty of puncture at the measurement point by comparing the parameter determined in the parameter generating section with a predetermined comparative evaluation reference value.

7. The puncture difficulty evaluating device according to claim 1, wherein the ultrasonic transmitting section irradiates each

measurement point with an ultrasonic pulse emitted from one ultrasonic transducer from a position distant from the measurement point by such an amount that the measurement point lies in a far sound field.

8. The puncture difficulty evaluating device according to claim 1, further comprising plural ultrasonic transducers arranged, wherein the ultrasonic transmitting section emits, from the plural ultrasonic transducers, ultrasonic pulses whose phases are controlled for the ultrasonic pulses to be focused on a predetermined measurement point.

9. The puncture difficulty evaluating device according to claim 1, wherein the ultrasonic transmitting section sequentially irradiates plural measurement points with ultrasonic pulses, the ultrasonic receiver section sequentially receives ultrasounds backscattered at the plural measurement points and sequentially determines integrals for the respective measurement points, and

the parameter generating section generates a parameter indicating the difficulty of puncture in each of the plural measurement points.

10. The puncture difficulty evaluating device according to claim 1, further comprising:

a B-mode image generating section that transmits an ultrasonic pulse to the specimen, receives an ultrasound backscattered in the specimen and generates a B-mode image; and an image display section that displays the B-mode image and an indication of the difficulty of puncture at the measurement point on the B-mode image, the indication being generated based on the parameter generated in said parameter generating section.

11. The puncture difficulty evaluating device according to claim 1, further comprising an ultrasonic probe for transmitting and receiving an ultrasound, wherein the ultrasonic transmitting section irradiates the measurement point with an ultrasonic pulse from the ultrasonic probe, and the ultrasonic receiver section receives the backscattered ultrasound at the ultrasonic probe.

12. The puncture difficulty evaluating device according to claim 11, further comprising:

a holding mechanism for holding the ultrasonic probe; and a guide mechanism that fixes the specimen and guides the movement of the holding mechanism, thereby guiding the movement of the ultrasonic probe supported by the holding mechanism along the specimen.

13. The puncture difficulty evaluating device according to claim 12, wherein the holding mechanism supports the ultrasonic probe

in such a manner that the position of the ultrasonic probe can be adjusted in a direction toward or away from the specimen.

14. The puncture difficulty evaluating device according to claim 12, wherein the holding mechanism supports the ultrasonic probe slidably in a direction crossing the direction in which the holding mechanism guided by the guide mechanism moves.

15. The puncture difficulty evaluating device according to claim 12, further comprising a puncture guide mechanism that guides puncture into the specimen fixed to the guide mechanism.

16. The puncture difficulty evaluating device according to claim 15, further comprising:

a B-mode image generating section that transmits an ultrasonic pulse to the specimen fixed to the guide mechanism, receives an ultrasound backscattered in the specimen and generates a B-mode image; and

an image display section that displays the B-mode image generated in the B-mode image generating section and displays, on the B-mode image, a destination point which is reached by the tip of a needle guided by the puncture guide mechanism to a puncture terminal point in the specimen.

17. The puncture difficulty evaluating device according to claim 11, wherein the ultrasonic probe comprises:

plural ultrasonic transducers having front surfaces facing the specimen concaved along a first direction and arranged in a second direction crossing the first direction;

a flexible acoustic coupler removably mounted on the front surfaces of the plural ultrasonic transducers; and

an acoustic coupler attachment mechanism that removably attaches the flexible acoustic coupler to the front surfaces of the plural ultrasonic transducers.